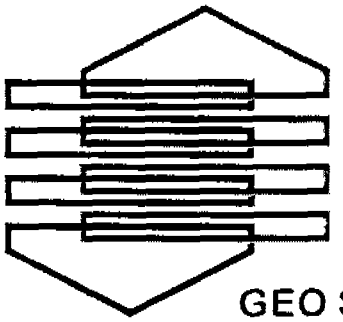
Thermal Test

Thermal Conductivity Test Report



Ewbank
and associates

GEO SYSTEMS PROFESSIONALS

17th Street Redevelopment Project Chattanooga, TN

Thermal Test

Earth Energy Engineering

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Thermal Conductivity Test Results
17th Street Redevelopment Project
Chattanooga, Tennessee

Earth Energy Engineering performed a thermal conductivity test at the 17th Street Redevelopment Project in Chattanooga, Tennessee on February 19, 2001. Testing was done by Fred Allison with a Ewbank portable test unit.

The test borehole was 280 feet in depth and 4" in diameter. A 1" inch loop was installed and the borehole was backfilled with #8 stone. Static water level was reported at 20 feet. The formations encountered were reported as primarily limestone.

The thermal conductivity **(k)** value for this borehole is **1.75 btu/degree F-hr-foot**. This is an average conductivity per foot for the borehole. This value represents the rate at which the borehole and rock will transfer heat.

To accurately measure the thermal conductivity of the formation a borehole should be drilled and grouted with a bentonite grout to prevent any flow of water through the borehole.

All test equipment, methods, procedures, calculations, and interpretation is done in accordance with the recommendations and guidelines of the International Ground Source Heat Pump Association.

Denver Diggin
Test Hole Drill Log

Client: Earth Energy Engineering
Location: 17th St., Chattanooga, Tn.
Start: 1-30-01
Complete: 1-31-01

Hole no. 1
Depth: 300 ft.
Diameter: 4 inch
Driller: Kevin Schischikowsky

Depth	Description	Notes
0 to 30 ft.	Red clay, stones, broken limestone, water at 16 ft.	Set 30 ft. casing 5 gpm
30 to 60 ft.	Broken laminated limestone	Ledges, loop insertion difficult
60 to 180 ft.	Gray limestone, laminated, small voids	
180 to 260 ft.	Solid limestone	
260 to 300 ft.	Dark brittle chert-like material, difficult broken fragments	

Total of 13 hours to get loop installed to 280 ft.
Used drilling mud to contain loose material in upper portion of hole, should have set 60 ft. of casing.
Very little circulation.
Hole back filled with #89 gravel and "hole plug".
Standing water level – 16 ft.

Added Note: **March 5, 2001**

Samples of the hard brittle material encountered from 260 to 300 ft. have been reviewed by a geologist with TVA and classified as quartz silicate that has been subjected to high temperatures.

T.R. Allison

Denver Diggin
Test Hole Drill Log

Client: Earth Energy Engineering
Location: 17th St., Chattanooga, Tn.
Start: 1-31-01
Complete: 1-31-01

Hole no. 2
Depth: 300 ft.
Diameter: 4 inch
Driller: Kevin Schischikowsky

Depth	Description	Notes
0 to 30 ft.	Red clay, stones, broken limestone, water at 18 ft.	Set 30 ft. casing 2 gpm.
30 to 45 ft.	Laminated limestone,clay layers	
45 to 100 ft.	Solid limestone	
100 to 180 ft.	Limestone, laminated,small voids.	
180 to 270 ft.	Solid limestone	
270 to 300 ft.	Dark brittle chert-like material, difficult broken fragments.	

Total of 6.5 hours to get loop installed to 285 ft.
Hole back filled with #89 gravel and "hole plug".